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U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: 032326-185

U.S. APPLICATION NO (If known, see 37 C.F.R. 1.5): 10/009728 Unassigned

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/FR00/01491	30 May 2000	17 June 1999

TITLE OF INVENTION: METHOD FOR MAKING A MODULE FOR CHIP CARDS AND RESULTING MODULE

APPLICANT(S) FOR DO/EO/US: Jean-Christophe FIDALGO and Lucille DOSSETTO

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (21) indicated below.
4. ☐ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 20 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
14. ☐ A SECOND or SUBSEQUENT preliminary amendment.
15. ☐ A substitute specification.
16. ☐ A change of power of attorney and/or address letter.
17. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
18. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
19. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
20. ☐ Other items or information:

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U.S. APPLICATION NO. (If known, see 37 C F R 1 5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
Unassigned 10/009728	PCT/FR00/01491	032326-185

21. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1,040.00 (960)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $890.00 (970)		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $740.00 (958)		
International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) $710.00 (956)		
International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00 (962)		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 890.00	
Surcharge of **$130.00 (154)** for furnishing the oath or declaration later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(e)).	$ -0-	

Claims	Number Filed	Number Extra	Rate		
Total Claims	28 -20 =	8	X$18.00 (966)	$ 144.00	
Independent Claims	6 -3 =	3	X$84.00 (964)	$ 252.00	
Multiple dependent claim(s) (if applicable)			+$280.00 (968)	$ -0-	
TOTAL OF ABOVE CALCULATIONS =				$ 1,286.00	
Reduction for 1/2 for filing by small entity, if applicable (see below).			+	$ -0-	-
SUBTOTAL =				$ 1,286.00	
Processing fee of **$130.00 (156)** for furnishing the English translation later than 20 ☐ 30 ☐ months from the earliest claimed priority date (37 CFR 1.492(f)).			+	$ -0-	
TOTAL NATIONAL FEE =				$ -0-	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00 (581)** per property			+	$ -0-	
TOTAL FEES ENCLOSED =				$ 1,286.00	
				Amount to be refunded:	$
				charged:	$

a. ☐ Small entity status is hereby claimed.

b. ☒ A check in the amount of $ 1,286.00 to cover the above fees is enclosed.

c. ☐ Please charge my Deposit Account No. 02-4800 in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

d. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 02-4800. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

James A. LaBarre
NAME

28,632
REGISTRATION NUMBER

December 17, 2001
DATE

Patent
Attorney's Docket No. 032326-185

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
Jean-Christophe FIDALGO et al	)	Group Art Unit: Unassigned
	)	
Application No.: Unassigned	)	Examiner: Unassigned
	)	
Filed: December 17, 2001	)	
	)	
For: METHOD FOR MAKING A MODULE FOR CHIP CARDS AND RESULTING MODULE	)	

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination and the calculation of filing fees, kindly amend the above-identified application as follows:

IN THE SPECIFICATION:

Page 1, immediately following the title appearing on lines 1 and 2, insert the following:

--This disclosure is based upon French Application No. 99/08123, filed on June 17, 1999 and International Application No. PCT/FR00/01491, filed May 30, 2000, which was published on December 28, 2000 in a language other than English, the contents of which are incorporated herein by reference.

Background of the Invention--

Page 6, before line 16, insert the following heading:

--**Summary of the Invention**--

Page 13, between lines 28 and 29, insert the following heading:

--**Brief Description of the Drawings**--

Page 14, before line 25, insert the following heading:

--**Description of the Invention**--

Add the following Abstract:

--A method for making a storage medium such as a smart card, of the type having a micromodule including a support film bearing a metallizing gate, and an integrated circuit chip connected to the metallizing gate. A metallizing gate is produced on the micromodule support film, and the support film is deformed such that at least a transfer zone is at a lower level relative to the plane of the metallizing gate. The invention is applicable to smart cards with flush contacts or without contacts.--

IN THE CLAIMS:

Kindly replace claims 1-26, as follows.

1. (Amended) A method for manufacturing a storage medium of the smart card type with flush contacts or without contacts, of the type comprising a micromodule including a support film carrying a metallisation grid, and an integrated-circuit chip placed

in an attachment area and connected to said metallisation grid, said method comprising the following steps, in any order:

producing a metallisation grid on the support film of the micromodule, and

deforming the support film so that at least said attachment area is at a lower level with respect to the plane of said metallisation grid.

2. (Amended) A method according to Claim 1, further including the subsequent steps of manufacturing chip cards on a reel and/or in line.

3. (Amended) A method according to Claim 1, wherein the metallisation grid is produced by a non-electrolytic method.

4. (Amended) A method according to Claim 3, further including deposition of a metallisation grid initiator by an additive method, in the form of a deposition of at least one metallisation initiator according to predefined patterns corresponding to the surfaces of said metallisation grid, by one of screen printing, pad printing, offset, inkjet, flexographic printing, tracing agent or any similar technique, followed by non-electrolytic fixing of at least one metal, such as Cu, Ni and/or Au, catalysed by said initiator on the areas in which it is present.

5. (Amended) A method according to Claim 4, wherein the metallisation initiator is chosen from amongst the catalytic materials based on palladium used for the metallisation of polymer substrates.

6. (Amended) A method according to Claim 4, wherein the metallisation initiator consists essentially of a film-forming agent such as polyurethane, an additive conferring appropriate surface activity, such as a polyester, a polyamide and/or a polyoxazolidone, an ionic and/or colloidal noble metal, or a covalent or complex compound thereof with organic ligands.

7. (Amended) A method according to Claim 4, further including activation of said initiator, by insolation under UV radiation, and a drying step.

8. (Amended) A method according to Claim 4, further including impregnation of the strip directly or subsequently in a bath of a salt of the metal chosen for the metallisation.

9. (Amended) A method according to Claim 4, further including a subsequent step of electrolytic deposition of an additional layer of metal, comprising at least one of Cu, Ni, Au or Pd, on the same areas of the support film as those which received the metallisation.

10. (Amended) A method according to Claim 3, further including non-electrolytic deposition of at least one metal, and the production of the metallisation according to predefined patterns, by a subtractive method according to an image corresponding to said metallisation grid by photolithography.

11. (Amended) A method according to Claim 3, further including the initial step of applying, to the support film, a fine layer of at least one metal such as Cu, Ni or Au, by means of a vacuum deposition technique.

12. (Amended) A method according to claim 1 wherein a mechanically cut metallic grid is laminated on a support film.

13. (Amended) A method according to Claim 10, wherein the photolithography includes the steps of:

depositing a layer of photosensitive resin on said metal,

insolation through a mask or film,

development of the resin,

chemical etching of the material in the areas not protected by resin, and

removal of the photosensitive resin.

14. (Amended) A method according to Claim 10, wherein, either before or after the implementation of the photolithography, performing an electrolytic deposition of a

metallic coating of Ni+Au, Ni+Pd and/or Ni+Pd+flash Au, where "flash Au" designates a thin deposition of the metal Au.

15. (Amended) A method according to claim 1 further comprising the following steps: fixing and connecting the chip before the deformation of the dielectric support film, and then deforming the support film by pressing it into a cavity in the card body, with a punch having a recess.

16. (Amended) A method according to Claim 13, further including the step of connecting the chip after deformation of the support film.

17. (Amended) A method according to Claim 16, wherein the support film is pressed and bonded by a punch in a recess or cavity formed in advance in a card body, and the chip is then connected whilst the film is fixed in the recess.

18. (Amended) A method according to Claim 16, wherein, to deform the film, it is placed in an impression in a suitable mould and pressed against an internal wall and, after introduction of the material into the cavity, the support film is deformed by the pressure of the material against a punch having a shape complementary to that of a recess to be formed and/or by the movement of the punch.

19. (Amended) A method for manufacturing a micromodule comprising an integrated-circuit chip provided with output pads which are electrically connected to a metallisation grid, comprising the following steps:

producing a metallisation grid on the support film of the micromodule,

deforming the support film so that at least a chip attachment area is at a lower level with respect to the plane of the metallisation grid,

attaching the integrated circuit chip on said pattern and making the connections,

coating the chip in a protective resin, and

cutting out said pattern in order to obtain a micromodule on an insulating support.

20. (Amended) A method according to claim 19 for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, further including the step of attaching and fixing of the micromodule in a cavity in said card, so as to position the metallisation grid flush with the surface of the card body.

21. (Amended) A method according to claim 1 for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, further including the following steps:

supplying a card body with a cavity,

attaching and fixing the micromodule including its chip and its connections in said cavity, so that the supporting substrate of the micromodule matches the shape of said cavity and so that the metallisation grid is flush with the surface of the card body, and

depositing a protective resin in the cavity.

22. (Amended) A method for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, of the type comprising an integrated-circuit chip embedded in the card body and which is connected to a metallisation grid, comprising the following steps:

producing said metallisation grid in a pattern on a substrate forming a dielectric support,

supplying a card body with a cavity,

attaching and fixing the substrate in the cavity, so that it matches the shape of said cavity and so that the metallisation grid is flush with the surface of the card body,

attaching the integrated-circuit chip in the bottom of the cavity, on said pattern, and making the connections, and

depositing a protective resin in the cavity.

23. (Amended) A module for a smart card comprising an integrated-circuit chip having output pads that are electrically connected to a metallization grid, and produced by the following method:

producing a metallisation grid on the support film of the micromodule,

deforming the support film so that at least a chip attachment area is at a lower level with respect to the plane of the metallisation grid,

attaching the integrated circuit chip on said pattern and making the connections,

coating the chip in a protective resin, and

cutting out said pattern, in order to obtain a micromodule on an insulating support.

24. (Amended) A module for a smart card according to Claim 23, including a metallisation initiator chosen from amongst the catalytic materials based on palladium used for the metallisation of polymer substrates.

25. (Amended) A module for a smart card, having a metallisation grid disposed on a dielectric support film and an integrated-circuit chip connected to said metallisation grid and disposed on an attachment area, wherein said attachment area is situated at a level lower than that of the metallisation grid.

26. (Amended) A smart card comprising a micromodule including a support film carrying a metallisation grid, and an integrated-circuit chip placed in an attachment area and connected to said metallisation grid, wherein said micromodule is produced by the following steps:

producing a metallisation grid on the support film of the micromodule, and

deforming the support film so that at least said attachment area is at a lower level with respect to the plane of said metallisation grid.

Add the following new claim:

28. (New) A method according to claim 6, wherein said organic ligands comprise at least one of an organic salt of CU, Au, Ag, Pt, Pd or Ru, organic and/or inorganic fillers and an organic solvent.

REMARKS

Entry of the foregoing amendment is respectfully requested. This amendment is intended to place the claims in a more conventional format and eliminate the multiple dependency of the claims.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

By: _____

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Date: December 17, 2001

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

1. (Amended) A method for manufacturing a storage medium of the smart card type with flush contacts or without [contact] contacts, of the type comprising a micromodule including a support film [1] carrying a metallisation grid [7], and an integrated-circuit chip [9] placed in an attachment area and connected to [the] said metallisation grid [7, the], said method [being characterised in that it includes] comprising the following steps, in any order[, consisting in]:

[-] producing a metallisation grid [7] on the support film [1] of the micromodule, and

[-] deforming the support film [1] so that at least [the] said attachment area is at a lower level with respect to the plane of [the] said metallisation grid.

2. (Amended) A method according to Claim 1, [characterised in that it also includes] further including the subsequent steps of manufacturing chip cards on a reel and/or in line.

3. (Amended) A method according to Claim 1, [characterised in that] wherein the metallisation grid is produced by a non-electrolytic method.

4. (Amended) A method according to Claim 3, [characterised in that it includes the] further including deposition of a metallisation grid initiator by an additive method, in

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

the form of a deposition of at least one metallisation initiator according to predefined patterns corresponding to the surfaces of [the] said metallisation grid, by one of screen printing, pad printing, offset, inkjet, flexographic printing, tracing agent or any similar technique, [then the] followed by non-electrolytic fixing of at least one [suitable] metal, such as [for example] Cu, Ni and/or Au, catalysed by [the] said initiator on the areas in which it is present.

5. (Amended) A method according to Claim 4, [characterised in that] wherein the metallisation initiator is chosen from amongst the catalytic materials based on palladium used for the metallisation of polymer substrates.

6. (Amended) A method according to Claim 4, [characterised in that] wherein the metallisation initiator consists essentially of a film-forming agent such as polyurethane, an additive conferring appropriate surface activity, such as a polyester, a polyamide and/or a polyoxazolidone, an ionic and/or colloidal noble metal, or a covalent or complex compound thereof with organic ligands[, in particular a complex or an inorganic salt of Cu, Au, Ag, Pt, Pd or Ru, organic and/or inorganic fillers and an organic solvent].

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

7. (Amended) A method according to Claim 4, [characterised in that it includes an] further including activation of [the] said initiator, [notably] by insolation under UV radiation, and a drying step.

8. (Amended) A method according to Claim 4, [characterised in that it comprises the] further including impregnation of the strip directly or subsequently in a bath [6] of a salt of the metal chosen for the metallisation[, for example Cu, Ni and/or Au, continuously, sequentially or discontinuously].

9. (Amended) A method according to Claim 4, [characterised in that it also includes] further including a subsequent step of electrolytic deposition of an additional layer of metal, [such as for example] comprising at least one of Cu, Ni, Au or Pd, on the same areas of the support film as those which received the [above mentioned] metallisation.

10. (Amended) A method according to Claim 3, [characterised in that it includes the] further including non-electrolytic deposition of at least one [suitable] metal, [such as for example Cu,] and the production of the metallisation according to predefined patterns, by a subtractive method according to an image corresponding to [the] said metallisation grid[, in particular] by photolithography.

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

11. (Amended) A method according to Claim 3, [characterised in that there is first of all applied to the polymer substrate to be treated, consisting of the above mentioned dielectric] further including the initial step of applying, to the support film, a fine layer of at least one metal such as Cu, Ni or Au, [preferably] by means of a vacuum deposition technique.

12. (Amended) A method according to [one of Claims 1 or 2, characterised in that] claim 1 wherein a mechanically cut metallic grid is laminated on a support film.

13. (Amended) A method according to Claim 10, [characterised in that] wherein the photolithography [proper] includes the steps of:

[-] depositing a layer of photosensitive resin on [the above mentioned] said metal,

[-] insolation through a mask or film,

[-] development of the resin,

[-] chemical etching of the material in the areas not protected by resin, and

[-] removal of the photosensitive resin.

14. (Amended) A method according to Claim 10, [characterised in that] wherein, either before or after the implementation of the photolithography, performing an electrolytic deposition of a metallic coating [is carried out, notably a coating] of Ni+Au,

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

Ni+Pd and/or Ni+Pd+flash Au, where "flash Au" designates a thin deposition of the metal Au.

15. (Amended) A method according to [any one of Claims 1 to 14, characterised in that it also comprises] claim 1 further comprising the following steps[, consisting in]: fixing and connecting the chip before the deformation of the dielectric support film, and then deforming the support film by pressing it into a cavity in the card body, with a punch having a recess.

16. (Amended) A method according to Claim 13, [characterised in that it comprises the step consisting in] further including the step of connecting the chip after deformation of the support film.

17. (Amended) A method according to Claim 16, [characterised in that] wherein the support film is pressed and bonded by a punch in a recess or cavity formed in advance in a card body, and the chip is then [being] connected[,] whilst the film is fixed in the recess.

18. (Amended) A method according to Claim 16, [characterised in that, in order] wherein, to deform the film, it is placed in an impression in a suitable mould[, it is]

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

and pressed against an internal wall and, after introduction of the material into the cavity, the support film is deformed by the pressure of the material against a punch [8] having a shape complementary to that of a recess to be formed and/or by the movement of the punch.

19. (Amended) A method for [the] manufacturing [of] a micromodule comprising an integrated-circuit chip [9] provided with output pads [10] which are electrically connected to a metallisation grid, [characterised in that it includes the steps, in an appropriate order, consisting in] comprising the following steps:

[-] producing a metallisation grid on the support film of the micromodule, [and

-] deforming the support film so that at least [the] a chip attachment area is at a lower level with respect to the plane of the metallisation grid,

[-] attaching the integrated circuit chip on [the] said pattern and making the connections,

[-] coating the chip in a protective resin, and

[-] cutting out [the] said pattern [with a view to separating it from the rest of the strip], in order to obtain a micromodule on an insulating support.

20. (Amended) A method according to claim 19 for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, [characterised in

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

that it includes the manufacture of a micromodule by the method according to Claim 19, and the attachment] further including the step of attaching and fixing of the micromodule in a cavity in [the] said card, [in order] so as to position the metallisation grid flush with the surface of the card body.

21. (Amended) A method according to claim 1 for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, [comprising a micromodule obtained by the method according to any one of Claims 1 to 16, in which] further including the following steps:

[-] supplying a card body [is supplied] with a cavity,

[-] attaching and fixing the micromodule including its chip and its connections [is attached and fixed in the] in said cavity, [for example by bonding under pressure,] so that the supporting substrate of the micromodule matches the shape of [the] said cavity and so that the metallisation grid is flush with the surface of the card body, and

[-] depositing a protective resin [11 is deposited] in the cavity.

22. (Amended) A method for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, of the type comprising an integrated-circuit chip [9] embedded in the card body and which is connected to a metallisation grid [7, characterised in that], comprising the following steps:

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

[- the] producing said metallisation grid [forms] in a pattern[, which is produced] on a substrate forming a dielectric support, [and in that it also includes the steps consisting in:]

[-] supplying a card body with a cavity,

[-] attaching and fixing the [precut] substrate in the cavity, [for example by gluing under pressure,] so that it matches the shape of [the] said cavity and so that the metallisation grid is flush with the surface of the card body,

[-] attaching the integrated-circuit chip in the bottom of the cavity, on [the] said pattern, and making the connections, and

[-] depositing a protective resin in the cavity.

23. (Amended) A module for a smart card[, obtained by the method according to Claim 19] comprising an integrated-circuit chip having output pads that are electrically connected to a metallization grid, and produced by the following method:

producing a metallisation grid on the support film of the micromodule,

deforming the support film so that at least a chip attachment area is at a lower level with respect to the plane of the metallisation grid,

attaching the integrated circuit chip on said pattern and making the connections,

coating the chip in a protective resin, and

cutting out said pattern, in order to obtain a micromodule on an insulating support.

Attachment to Preliminary Amendment dated December 17, 2001

Marked-up Claims 1-27

24. (Amended) A module for a smart card according to Claim 23, [characterised in that it has] including a metallisation initiator[, notably] chosen from amongst the catalytic materials based on palladium used for the metallisation of polymer substrates.

25. (Amended) A module for a smart card, having a metallisation grid disposed on a dielectric support film and an integrated-circuit chip connected to [the] said metallisation grid and disposed on an attachment area, [characterised in that the] wherein said attachment area is situated at a level lower than that of the metallisation grid.

26. (Amended) A smart card[, obtained by the method according to any one of Claims 1-18 and 20-22] comprising a micromodule including a support film carrying a metallisation grid, and an integrated-circuit chip placed in an attachment area and connected to said metallisation grid, wherein said micromodule is produced by the following steps:

producing a metallisation grid on the support film of the micromodule, and

deforming the support film so that at least said attachment area is at a lower level with respect to the plane of said metallisation grid.

GEM735

A METHOD FOR MANUFACTURING A MODULE FOR SMART CARDS AND THE MODULE OBTAINED

The present invention relates to the manufacture of electronic modules intended to be inset in devices in the form of cards, known as smart cards, and the manufacture of such smart cards. It more particularly relates to a method for manufacturing modules for smart cards with flush contacts and/or without contact, as well as the manufacture of the corresponding smart cards.

Smart cards are used for performing various operations, such as for example banking operations, the management of telephone communications or various identification operations.

Contact cards have metallisations, forming contact areas, which are flush with the surface of the card. These metallisations are disposed at a precise point on the card body, defined by ISO 7816. They are intended

to come into contact with the reading head of a reading apparatus, with a view to electrical transmission of data between the card and the reader and vice-versa. The same applies to the flush contact part of hybrid smart cards.

A smart card module with flush contacts consists of a support made from electrically non-conductive material, the said support being stuck to a metallic element forming a grid of contacts, so as to have contact areas and possibly conductive tracks, and an electronic microcircuit chip, which is stuck to the other face of the said support and which has output pads on its face either opposite to the one fixed to the support or turned towards it, depending on the method for mounting the chip on the said support.

A so-called hybrid smart card has a dual functioning mode. The chip is then connected to the contact terminal block and to an antenna. The terminal block and the antenna are interface elements, which have to be connected with appropriate pads on the microcircuit. The standard products of this type use for the most part a chip assembled in a module and a card body integrating the antenna. The connection between the two elements is provided at the time of insetting, when the module is attached in the cavity provided for this purpose in the card body.

In general terms, the metallisation grid consists of contact areas and possibly conductive tracks in the flush contact cards, and the antenna in the case of a contactless smart card.

In all cases, the metallisation requires the greatest care and is one of the steps of manufacturing printed circuit modules which form a major part of the total cost of these modules.

The quality of the production of this metallisation also greatly influences the reject level during quality checks.

To simplify, reference will be made hereinafter solely to flush contact smart cards.

Amongst the known methods for manufacturing smart cards, the main ones are methods based on the assembly of the integrated circuit chip in a sub-assembly referred to as a micromodule, which is assembled by means of traditional techniques.

A conventional method consists in gluing an integrated-circuit chip by disposing its active face with its contact pads on the same side as that of the dielectric support on which the gluing is effected. The dielectric material, in practice a sheet or a part of a strip, is itself disposed on a contact grid on a metallic plate made from nickel and gold-plated copper. Connection welds are formed in the dielectric material and connection wires provide the connection between the contact areas of the grid and the pads on the chip. To protect the assembly, an epoxy-based encapsulation resin coats the chip and the soldered connection wires. The module thus formed is then cut out and inset in the cavity of a previously decorated card body.

Such a method is however expensive, since a large number of manufacturing steps are necessary.

One object of the present invention is to produce, at lesser cost, a module for a contact smart card.

A description has been given, notably in the documents FR2671416, FR2671417 and FR2671418, of techniques for manufacturing smart cards without an intermediate step of producing a micromodule, comprising the insetting of an integrated circuit chip directly in a card body. These techniques are based on a step of local softening of the card body made from plastics material and pressing the chip into the area thus softened. The chip is then disposed so that its contact pads are flush with the surface of the card. Screen printing operations then make it possible to print, on the same plane, contact areas and conductive tracks, the latter making it possible to connect the contact areas to the contact pads on the chip. Finally, a protective lacquer must be applied to the chip, and to the connections between the contact pads on the chip and the above mentioned conductive tracks.

However, with such a method, only small-sized chips can be processed. In addition, the operation of screen printing the contact areas and the interconnection tracks is tricky to implement, since the positioning of the tracks on the contact pads of the chip already in place requires very great precision of location, which must be checked by Computer Aided Vision (CAV). This constraint impairs the production rate and the efficiency of the manufacturing method. In addition, the chip is applied to a softened area in which it is not easy to position it correctly, in

perfect parallelism with the lateral edges of the card. Any defect in the implementation of the method at any one of these stages then gives rise to the scrapping of the complete card, including the chip.

Another solution proposed for reducing the cost price of smart cards uses so-called "Chrysalis" technology, which is based on the application of electrically-conductive tracks by a process of the MID ("Moulded Interconnection Device" in English-language literature) type. According to various methods using this technology, described for example in the documents EP-A-0 753 827, EP-A-0 688 050 and EP-A-0 688 051, the card is provided with a housing intended to receive the integrated circuit. Electrically conductive tracks are disposed against the bottom and the side walls of these housings and are connected to metallic contact areas formed on the surface of the card support.

The application of the conductive tracks in the said housing can be effected in three different ways:

- A first way consists in effecting a hot stamping. A sheet containing copper metallisations, possibly covered with tin or nickel, and provided with a heat-activated glue, is cut out, and then glued hot in the said housing.

- A second way consists in applying, by means of a pad, a lacquer containing a palladium catalyst, at the points intended to be metallised, and heating the lacquer. The metallisation is then carried out by the deposition of copper and/or nickel, by means of an electrochemical autocatalysis process.

- A third way consists in effecting a lithogravure using laser holograms. This lithogravure makes it possible to effect metallisation depositions in three dimensions with very great precision and high resolution.

According to these techniques, it is the card body proper which is to be metallised, before its final printing, which increases the cost of printing rejects accordingly. In addition, it is in this case necessary to attach the chip directly in the card body, which requires transfer equipment with a lower rate than those used for transfer on a strip. The cost price of the cards thus manufactured therefore remains high, whilst the scrapping level is also maintained at a high level.

With a view to large scale industrial production at lesser cost, there has now been developed according to the present invention a method for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, comprising a micromodule having a dielectric support film having a metallisation grid, and an integrated-circuit chip connected to the said metallisation grid, the said method including the steps, in any order, consisting in:

- producing a metallisation grid on the support film of the micromodule, and

- deforming the support film so that at least the said attachment area is at a lower level with respect to the plane of the said metallisation grid.

The advantages which this method procures are notably:

- it uses a technique making it possible to avoid the steps of gluing and perforation of the dielectric support,
- it makes it possible to use low-cost dielectric support materials,
- it allows the use of existing machines,
- it makes it possible to combine the said metallisation with the subsequent steps of making up the smart cards, on a coil and/or in line.

With the method according to the invention, the contact areas and/or the antenna and any conductive tracks are on the same face of the dielectric support film and the method thus avoids an additional step. It is also possible, in one embodiment of this method, to be free of the constraint to which the electrolytic depositions are subject, namely the obligation to raise all the areas to be metallised to the same potential.

According to a first embodiment, the method according to the invention includes the deposition of a metallisation grid initiator by an additive method, in the form of a deposition of at least one metallisation catalysing initiator according to the predefined patterns corresponding to the said metallisation grid, for example by screen printing, pad printing, offset, inkjet, flexographic printing, tracing agent or any similar technique, and then the non-electrolytic fixing of at least one suitable metal, such as for example Cu,

Ni and/or Au, catalysed by the said initiator on the areas in which the latter is present.

The metallisation method according to the present invention does not concern screen printing in itself.

The metallisation initiator is preferably chosen from amongst catalytic materials based on palladium used for the metallisation of polymer substrates and notably those described in the documents EP-A-0485839 and EP-A-0647729.

Such products constituting the above mentioned initiator can consist in practice of a film-forming agent such as polyurethane, an additive conferring appropriate surface activity, such as a polyester, a polyamide and/or a polyoxazolidone, an ionic and/or colloidal noble metal, or a covalent or complex compound thereof with organic ligands, in particular a complex or an inorganic salt of Cu, Au, Ag, Pt, Pd or Ru, organic and/or inorganic fillers and an organic solvent.

According to a preferred variant implementation of this first embodiment of the method according to the invention, it is possible to activate the said initiator, notably by insolation and UV radiation, and to subject it to drying, for example by hot air.

The strip thus treated can be impregnated directly or subsequently in a bath of a salt of the metal chosen for the metallisation, for example Cu, Ni and/or Au, continuously, sequentially or discontinuously.

This variant implementation of the first method according to the invention also includes advantageously

a subsequent step of electrolytic deposition, according to the conventional methods, of a supplementary layer of metal, such as for example Cu, Ni, Au or Pd, on the same areas of the support film as those which receive the above mentioned metallisation. Such a supplementary deposition of metallisation, over a thickness of a few μm preferably, has proved to be advantageous and is recommended for producing a strengthened metallisation, affording good efficiency during the wire welding operation, since it presents rapid growth kinetics.

According to a second embodiment, the method according to the invention includes the non-electrolytic deposition of at least one suitable metal, such as for example Cu, and the production of the metallisation grid according to predefined patterns, by a subtractive method according to an image corresponding to the said metallisation grid, in particular by photolithography.

In this embodiment of the invention, photolithography is preferred as the subtractive method, for which there is applied first of all, to the polymer substrate to be processed, consisting of the above mentioned dielectric support film, a fine layer of at least one metal such as for example Cu, Ni or Au, preferably by means of a vacuum deposition technique. It is also possible to start from a copper cladding, consisting of a strip of laminated copper, with or without adhesive, on a dielectric support, which can be a commercially available low-cost dielectric material.

The photolithography proper includes the steps of:

- depositing a layer of photosensitive resin on the above mentioned metal,
- insolation through a mask or film,
- development of the resin,
- chemical etching of the material in the areas not protected by resin, and
- removal of the photosensitive resin.

According to a preferred variant of this embodiment of the method which is the first object of the invention, there is also carried out, either before or after the implementation of the photolithography, an electrolytic deposition of a metallic coating, for improving the weldability of the elements together and reducing the contact resistance, notably a coating of Ni+Au, Ni+Pd and/or Ni+Pd+flash Au, where "flash Au" is a well-established expression for designating a thin deposit of the metal Au.

As a variant, the method can comprise the steps consisting in: fixing and connecting the chip before the above mentioned deformation of the dielectric support film, and then deforming the support film by pressing it into a housing in the card body, with a punch having a recess.

According to a more particularly preferred embodiment, the method comprises the step consisting in connecting the chip after deformation of the support film.

Two embodiments of this second variant are possible:

- the support film is pressed and glued by means of a punch in a housing, or cavity, formed in advance in a card body. The chip is then connected, whilst the film is fixed in the housing;

- the support film is placed in a cavity in a suitable mould, pressed against an internal wall and, after introduction of the material into the cavity, deformed by pressing the material against a punch having a shape complementary to that of a housing to be formed and/or by the movement of the punch.

It is also possible to facilitate the deformation of the sheet by applying a negative pressure, advantageously by means of an orifice situated at the bottom of the female part.

Naturally, the difference between the plane of the bottom level resulting from the said deformation and that of the metallisation grid must be sufficient for it to be possible to house the chip therein and that also the coating material for the chip and the interconnections finds room there, advantageously without overflow onto the surface with which the above mentioned contact areas fit flush.

Another object of the invention is a method for the manufacturing of a micromodule comprising an integrated-circuit chip provided with output pads which are electrically connected to a metallisation grid, including the steps, in a suitable order, consisting of:

- producing a metallisation grid on the support film of the micromodule, and

- deforming the support film so that at least the chip attachment area is at a lower level with respect to the plane of the metallisation grid,
- attaching the integrated circuit chip on the said pattern and making the connections,
- coating the chip in a protective resin, and
- cutting out the said pattern with a view to separating it from the rest of the strip, in order to obtain a micromodule on an insulating support.

The connections between the chip pads and the metallic grid can be made by any methods known to experts.

It should also be noted that the dielectric support film is not necessarily a thermoplastic material and may for example consist of paper.

In a variant, the metallic grid can be formed by mechanical cutting from a metallic ribbon forming the metallic grid (lead frame), which is laminated on a dielectric support film.

Another object of the invention is a method for manufacturing a memory support of the smart card type with flush contacts and/or without contact, comprising a micromodule produced in accordance with the method for manufacturing a micromodule according to the invention, in which:

- a card body is supplied with a cavity,
- the micromodule including its chip and its connections is attached and fixed in the said cavity, for example by gluing under pressure, so that the support substrate of the micromodule matches the shape

of the said cavity and so that the metallisation grid is flush with the surface of the card body, and

- a protective resin is deposited in the cavity.

Another object of the invention consists, in another embodiment, of a method for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, comprising an integrated circuit chip embedded in the card body and which is connected to a metallisation grid, according to which:

- the said metallisation grid forms a pattern, which is produced on a substrate forming a dielectric support,

and also including the steps consisting in:

- supplying a card body with a cavity,

- attaching the precut substrate in the cavity, for example by gluing under pressure, so that it matches the shape of the said cavity and so that the metallisation grid is flush with the surface of the card body,

- attaching the integrated-circuit chip in the bottom of the cavity, on the said pattern, and making the connections, and

- depositing a protective resin in the cavity.

Thus, in one embodiment of the method according to the invention, the forming step is carried out at the time of attaching the module in the card cavity.

Other particularities and advantages of the present invention will emerge in the light of the

following description, given by way of illustrative and non-limitative example, and made with reference to the accompanying figures, which show:

- Fig. 1 a schematic view in transverse section of a metallisation on a strip of dielectric support film by means of the method according to the invention.
- Fig. 2 a schematic view in transverse section of the subsequent non-electrolytic deposition by passing through a bath of a metallic salt.
- Fig. 3 a schematic view in transverse section of the thermoforming of a micromodule isolated from the strip coming from the previous step, according to Figure 2,
- Fig. 4 a schematic view in transverse section after gluing of a chip on the previously thermoformed support as depicted in Figure 3,
- Fig. 5 a schematic view in transverse section after wiring between the chip and the tracks of the substrate coming from the gluing operation according to Figure 4,
- Fig. 6 a schematic view in transverse section of the micromodule according to Figure 5, after a coating of the chip and connections, using the volume of the previously formed cavity.

In a first step, a strip 1 of dielectric support film for smart card micromodules is caused to pass between reels 2 opposite a screen-printing device 3, and then advantageously under an insolation device 4 and a hot-drying device 5.

In a second step, the strip 1 is caused to pass through a metallisation bath 6 according to the invention, such as for example for a non-electrolytic metallisation as described above, in order to form on the strip 1 metallised areas intended to form metallisation grids 7 for a smart card with flush contacts and/or without contacts.

Next a cavity is created by thermoforming, at a temperature higher than the glass transition temperature of the substrate of the strip 1, in a conventional thermoforming apparatus 8, either on a unit for a micromodule, or preferably on the substrate 1 in roll form on the reels 2, or possibly in line.

A chip 9 is then glued in the bottom of the cavity thus formed.

By means of wiring using connection wires 10 between the pads on the chip 9 and the metallisation grid 7 carried by the strip 1, the chip 9 is connected with the said grid 7.

The manufacture of the micromodule for a smart card also comprises the coating of the chip 9 and the connections in an appropriate resin 11, inside the volume of the above mentioned cavity.

As an option, it is possible to interpose, between the passage through the metallisation bath 6 and the thermoforming with the device 8, a step of electrolytic deposition of metal (not shown), which increases the thickness of metal deposited on the strip 1 in order to form the metallisation grid.

The photolithography technique, not shown, involves means with which experts in the technique concerned are familiar. Their principle was stated above and they therefore do not need to be detailed here.

In a variant embodiment of the method for manufacturing a storage medium of the complete smart card type, the micromodule, or the substrate corresponding to the part of the dielectric support film supporting the pattern without the chip, is inserted in the body of the storage medium during the injection thereof. To do this, the substrate is separated from the rest of the strip and cut to the final dimensions of the micromodule. This substrate, with or without a chip according to circumstances, is then clamped in the injection mould, in order to be held therein in position during the injection of the material making up the card body, and conferring the required seal so that the injected material does not pass between the module and the mould and does not cover the above mentioned grid. In practice, this clamping can be effected by suction or by an electrostatic method. The material making up the card body is then injected into the mould.

Where the injection is performed in a mould with a fixed core, the substrate takes the shape of the mould under the pressure of the injected material.

Where the injection is performed in a mould with a movable core, firstly the material is injected and

secondly the substrate is deformed by fitting the core to the dimensions of the cavity just after injection.

At the end of this injection operation, a card is obtained provided with a module formed to the reliefs of the required cavity, with flush electrical contacts.

The storage medium according to the invention thus has a three-dimensional metallisation grid.

In a variant embodiment, the substrate of the micromodule can also have perforations formed in its thickness. These perforations are aimed at allowing the encapsulation resin to come into direct contact with the material of the card body, and thus to constitute a point of anchoring the module in the cavity. In addition they make it possible to discharge any air bubbles which may be trapped between the cavity of the card body and the substrate.

Thus another object of the invention is a module for a smart card having a metallisation grid disposed on a dielectric support film and an integrated-circuit chip connected to the said metallisation grid and disposed on an attachment area, the said attachment area being situated at a level lower than that of the metallisation grid.

Another object of the invention is a module for a smart card having a metallisation initiator, notably chosen from amongst the catalytic materials based on palladium used for the metallisation of polymer substrates.

CLAIMS

1. A method for manufacturing a storage medium of the smart card type with flush contacts or without contact, comprising a micromodule including a support film 1 carrying a metallisation grid 7, and an integrated-circuit chip 9 placed in an attachment area and connected to the said metallisation grid 7, the said method being characterised in that it includes the steps, in any order, consisting in:

- producing a metallisation grid 7 on the support film 1 of the micromodule, and
- deforming the support film 1 so that at least the said attachment area is at a lower level with respect to the plane of the said metallisation grid.

2. A method according to Claim 1, characterised in that it also includes the subsequent steps of manufacturing chip cards on a reel and/or in line.

3. A method according to Claim 1, characterised in that the metallisation grid is produced by a non-electrolytic method.

4. A method according to Claim 3, characterised in that it includes the deposition of a metallisation grid initiator by an additive method, in the form of a deposition of at least one metallisation initiator according to predefined patterns corresponding to the surfaces of the said metallisation grid, by screen printing, pad printing, offset, inkjet, flexographic printing, tracing agent or any similar technique, then the non-electrolytic fixing of at least one suitable

metal, such as for example Cu, Ni and/or Au, catalysed by the said initiator on the areas in which it is present.

5. A method according to Claim 4, characterised in that the metallisation initiator is chosen from amongst the catalytic materials based on palladium used for the metallisation of polymer substrates.

6. A method according to Claim 4, characterised in that the metallisation initiator consists essentially of a film-forming agent such as polyurethane, an additive conferring appropriate surface activity, such as a polyester, a polyamide and/or a polyoxazolidone, an ionic and/or colloidal noble metal, or a covalent or complex compound thereof with organic ligands, in particular a complex or an inorganic salt of Cu, Au, Ag, Pt, Pd or Ru, organic and/or inorganic fillers and an organic solvent.

7. A method according to Claim 4, characterised in that it includes an activation of the said initiator, notably by insolation under UV radiation, and a drying.

8. A method according to Claim 4, characterised in that it comprises the impregnation of the strip directly or subsequently in a bath 6 of a salt of the metal chosen for the metallisation, for example Cu, Ni and/or Au, continuously, sequentially or discontinuously.

9. A method according to Claim 4, characterised in that it also includes a subsequent step of electrolytic deposition of an additional layer of

metal, such as for example Cu, Ni, Au or Pd, on the same areas of the support film as those which received the above mentioned metallisation.

10. A method according to Claim 3, characterised in that it includes the non-electrolytic deposition of at least one suitable metal, such as for example Cu, and the production of the metallisation according to predefined patterns, by a subtractive method according to an image corresponding to the said metallisation grid, in particular by photolithography.

11. A method according to Claim 3, characterised in that there is first of all applied to the polymer substrate to be treated, consisting of the above mentioned dielectric support film, a fine layer of at least one metal such as Cu, Ni or Au, preferably by means of a vacuum deposition technique.

12. A method according to one of Claims 1 or 2, characterised in that a mechanically cut metallic grid is laminated on a support film.

13. A method according to Claim 10, characterised in that the photolithography proper includes the steps of:

- depositing a layer of photosensitive resin on the above mentioned metal,
- insolation through a mask or film,
- development of the resin,
- chemical etching of the material in the areas not protected by resin, and
- removal of the photosensitive resin.

14. A method according to Claim 10, characterised in that, either before or after the implementation of the photolithography, an electrolytic deposition of a metallic coating is carried out, notably a coating of Ni+Au, Ni+Pd and/or Ni+Pd+flash Au, where "flash Au" designates a thin deposition of the metal Au.

15. A method according to any one of Claims 1 to 14, characterised in that it also comprises the following steps, consisting in: fixing and connecting the chip before the deformation of the dielectric support film, and then deforming the support film by pressing it into a cavity in the card body, with a punch having a recess.

16. A method according to Claim 13, characterised in that it comprises the step consisting in connecting the chip after deformation of the support film.

17. A method according to Claim 16, characterised in that the support film is pressed and bonded by a punch in a recess or cavity formed in advance in a card body, the chip then being connected, whilst the film is fixed in the recess.

18. A method according to Claim 16, characterised in that, in order to deform the film, it is placed in an impression in a suitable mould, it is pressed against an internal wall and, after introduction of the material into the cavity, the support film is deformed by the pressure of the material against a punch 8 having a shape complementary to that of a recess to be formed and/or by the movement of the punch.

19. A method for the manufacturing of a micromodule comprising an integrated-circuit chip 9 provided with output pads 10 which are electrically connected to a metallisation grid, characterised in that it includes the steps, in an appropriate order, consisting in:

- producing a metallisation grid on the support film of the micromodule, and
- deforming the support film so that at least the chip attachment area is at a lower level with respect to the plane of the metallisation grid,
- attaching the integrated circuit chip on the said pattern and making the connections,
- coating the chip in a protective resin, and
- cutting out the said pattern with a view to separating it from the rest of the strip, in order to obtain a micromodule on an insulating support.

20. A method for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, characterised in that it includes the manufacture of a micromodule by the method according to Claim 19, and the attachment and fixing of the micromodule in a cavity in the said card, in order to position the metallisation grid flush with the surface of the card body.

21. A method for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, comprising a micromodule obtained by the method according to any one of Claims 1 to 16, in which:

- a card body is supplied with a cavity,
- the micromodule including its chip and its connections is attached and fixed in the said cavity, for example by bonding under pressure, so that the supporting substrate of the micromodule matches the shape of the said cavity and so that the metallisation grid is flush with the surface of the card body, and
- a protective resin 11 is deposited in the cavity.

22. A method for manufacturing a storage medium of the smart card type with flush contacts and/or without contact, comprising an integrated-circuit chip 9 embedded in the card body and which is connected to a metallisation grid 7, characterised in that:

- the said metallisation grid forms a pattern, which is produced on a substrate forming a dielectric support,

and in that it also includes the steps consisting in:

- supplying a card body with a cavity,
- attaching and fixing the precut substrate in the cavity, for example by gluing under pressure, so that it matches the shape of the said cavity and so that the metallisation grid is flush with the surface of the card body,
- attaching the integrated-circuit chip in the bottom of the cavity, on the said pattern, and making the connections, and
- depositing a protective resin in the cavity.

23. A module for a smart card, obtained by the method according to Claim 19.

24. A module for a smart card according to Claim 23, characterised in that it has a metallisation initiator, notably chosen from amongst the catalytic materials based on palladium used for the metallisation of polymer substrates.

25. A module for a smart card, having a metallisation grid disposed on a dielectric support film and an integrated-circuit chip connected to the said metallisation grid and disposed on an attachment area, characterised in that the said attachment area is situated at a level lower than that of the metallisation grid.

26. A smart card, obtained by the method according to any one of Claims 1-18 and 20-22.

27. A smart card, containing a module according to Claim 25.

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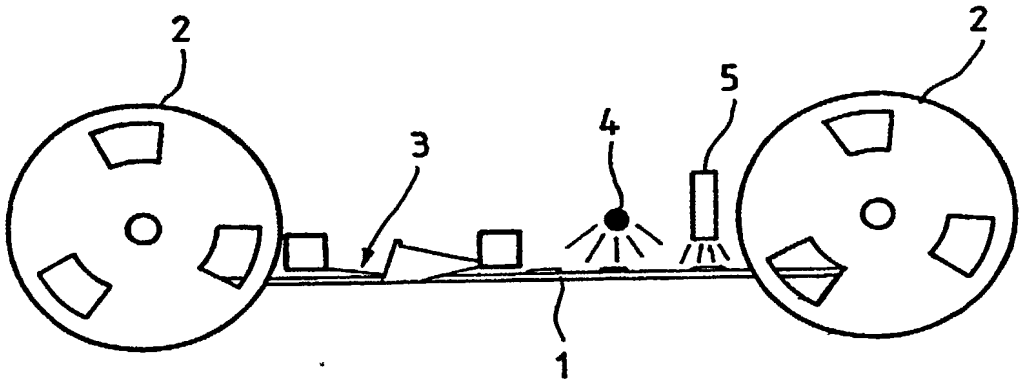
[Suite sur la page suivante]

(54) Title: METHOD FOR MAKING A MODULE FOR CHIP CARDS AND RESULTING MODULE

(54) Titre: PROCEDE POUR LA FABRICATION D'UN MODULE POUR CARTES A PUCES ET MODULE OBTENU



(57) Abstract: The invention concerns a method for making a storage medium such as a chip card, comprising a micromodule including a support film (1) bearing a metallizing gate (7), and an integrated circuit chip (9) connected to said metallizing gate. The method comprises steps which consist in: producing a metallizing gate (7) on the micromodule support film (1), and deforming the support film (1) such that at least said transfer zone is at a lower level relative to the plane of said metallizing gate. The invention is applicable to chip cards with flush contacts or without contact.

(57) Abrégé: Procédé de fabrication d'un support de mémorisation de type carte à puce, comprenant un micromodule comportant un film support (1) portant une grille de métallisation (7), et une puce de circuit intégré (9) reliée à ladite grille de métallisation. Le procédé comporte les étapes consistant à: réaliser une grille de métallisation (7) sur le film support (1) du micromodule, et déformer le film support (1) de manière qu'au moins ladite zone de report soit à un niveau inférieur par rapport au plan de ladite grille de métallisation. Application aux cartes à puce à contacts affleurants et/ou sans contact.

WO 00/79478 A1

FIG_1

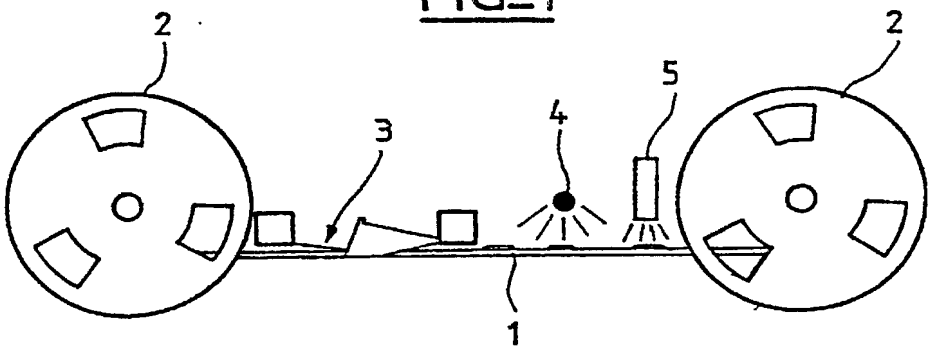


FIG_2

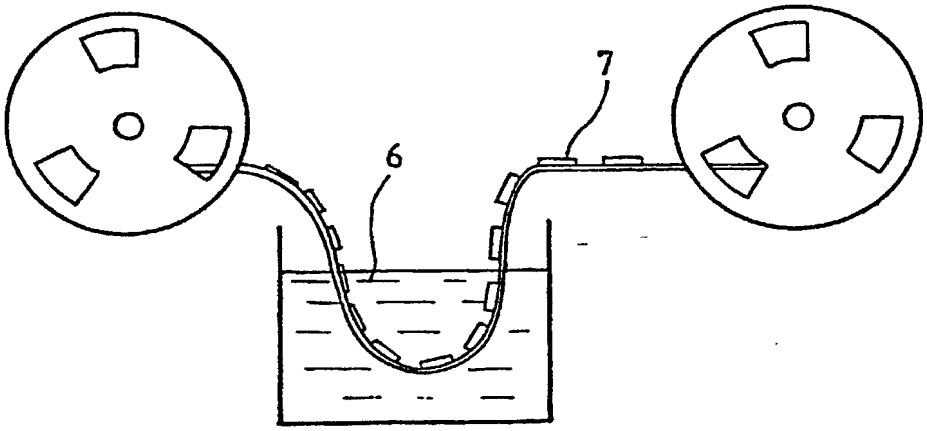


FIG_3

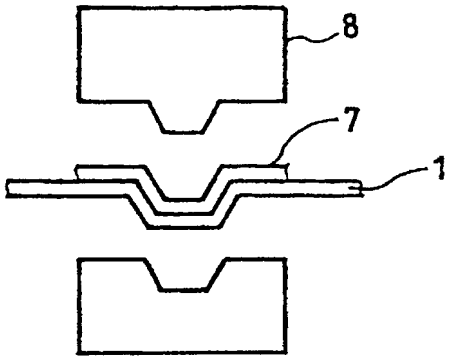


FIG_4

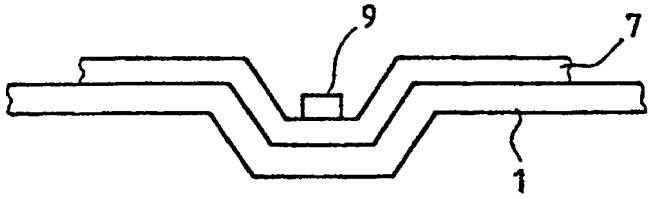


FIG_5

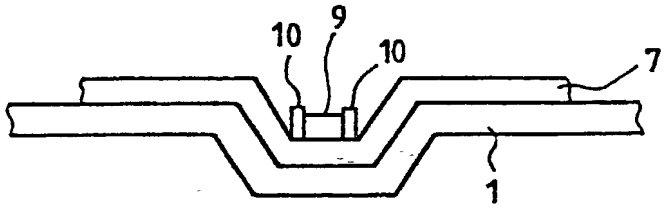
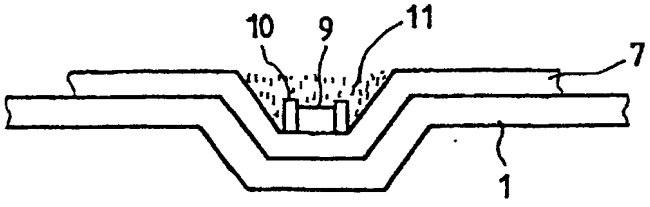


FIG_6



COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D)
(Includes Reference to Provisional and International (PCT) Applications)

Attorney's Docket No. GEM735

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States applications(s) or International (PCT) Application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose to the U.S Patent and Trademark Office all information known to me to be material to the patentability as defined in Title 37, Code of Federal Regulations § 1.56, which became available between the filing date of the prior application(s) and the national or international filing date of this application:

PRIOR U.S. APPLICATIONS OR INTERNATIONAL (PCT) APPLICATIONS DESIGNATING THE U.S. FOR BENEFIT UNDER 35 U S.C § 120:

U.S. APPLICATIONS		STATUS *(check one)*		
U.S. APPLICATION NUMBER	U S. FILING DATE	PATENTED	PENDING	ABANDONED
		☐	☐	☐

PCT APPLICATIONS DESIGNATING THE U.S					
PCT APPLICATION NO.	PCT FILING DATE	U S APPLICATION NUMBERS ASSIGNED (if any)			

I hereby appoint the following attorneys and agent(s) to prosecute said application and to transact all business in the U.S. Patent and Trademark Office connected therewith and to file, prosecute and to transact all business in connection with international applications directed to said invention:

William L. Mathis	17,337	R Danny Huntington	27,903	Gerald F. Swiss	30,113
Robert S. Swecker	19,885	Eric H Weisblatt	30,505	Charles F. Wieland III	33,096
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Benton S. Duffett, Jr.	22,030	Teresa Stanek Rea	30,427	Todd R Walters	34,040
Norman H. Stepno	22,716	Robert E. Krebs	25,885	Ronni S Jillions	31,979
Ronald L. Grudziecki	24,970	William C Rowland	30,888	Harold R Brown III	36,341
Frederick G Michaud, Jr.	26,003	T Gene Dillahunty	25,423	Allen R. Baum	36,086
Alan E. Kopecki	25,813	Patrick C. Keane	32,858	Steven M duBois	35,023
Regis E. Slutter	26,999	B Jefferson Boggs, Jr	32,344	Brian P O'Shaughnessy	32,747
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Robert G. Mukai	28,531	Peter K Skiff	31 917	Fred W Hathaway	32,236
George A. Hovanec, Jr.	28,223	Richard J McGrath	29,195		
James A. LaBarre	28,632	Matthew L Schneider	32 814		
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and: _____.

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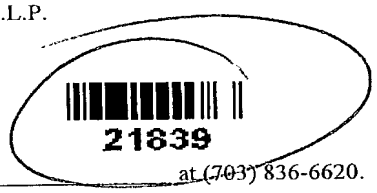
Alexandria, Virginia 22313-1404



Address all telephone calls to: _____ at (703) 836-6620.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (Includes Reference to Provisional and International (PCT) Applications)	Attorney's Docket No. GEM735

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name;
I BELIEVE I AM THE ORIGINAL, FIRST AND SOLE INVENTOR (IF ONLY ONE NAME IS LISTED BELOW) OR AN ORIGINAL, FIRST AND JOINT INVENTOR (IF PLURAL NAMES ARE LISTED BELOW) OF THE SUBJECT MATTER WHICH IS CLAIMED AND FOR WHICH A PATENT IS SOUGHT ON THE INVENTION ENTITLED.

METHOD FOR MAKING A MODULE FOR CHIP CARD AND RESULTING MODULE

The specification of which **(check only one item below)**:

☐ is attached hereto.
☐ was filed as United States Patent Application Number ___
on__
and was amended on _____ (if applicable).

☒ was filed as International (PCT) Application Number PCT/FR00/01491
on May 30 th 2000
and was amended on _ (if applicable).

I HAVE REVIEWED AND UNDERSTAND THE CONTENTS OF THE ABOVE-IDENTIFIED SPECIFICATION, INCLUDING THE CLAIMS, AS AMENDED BY ANY AMENDMENT REFERRED TO ABOVE

I ACKNOWLEDGE THE DUTY TO DISCLOSE TO THE U S. PATENT AND TRADEMARK OFFICE ALL INFORMATION KNOWN TO ME TO BE MATERIAL TO PATENTABILITY AS DEFINED IN TITLE 37, CODE OF FEDERAL REGULATIONS, Sec. 1.56 (as amended effective March 16, 1992);

I do not know and do not believe the said invention was ever known or used in the United States of America before my or our invention thereof, or patented or described in any printed publication in any country before my or our invention thereof or more than one year prior to said application; that said invention was not in public use or on sale in the United States of America more than one year prior to said application; that said invention has not been patented or made the subject of an inventor's certificate issued before the date of said application in any country foreign to the United States of America on any application filed by me or my legal representatives or assigns more than six months prior to said application;

I hereby claim foreign priority benefits under Title 35, United States Code, §§ 119 (a)-(e) of any foreign application(s) for patent or inventor's certificate or of any International (PCT) Application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT International (PCT) Application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. §119:

COUNTRY (if PCT, indicate "PCT")	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. §119
FRANCE	FR99/08123	17/06/1999	☒Yes ☐No
			☐Yes ☐No
			☐Yes ☐No
			☐Yes ☐No
			☐Yes ☐No

I hereby claim the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

(APPLICATION NUMBER) (FILING DATE)

(APPLICATION NUMBER) (FILING DATE)

COMBINED DECLARATION FOR PATENT APPLICATION AND POWER OF ATTORNEY (CONT'D) **(Includes Reference to Provisional and International (PCT) Applications)**	Attorney's Docket No. GEM735

FULL NAME OF SECOND JOINT INVENTOR, IF ANY FIDALGO Jean-Christophe	SIGNATURE	DATE 12/03/01
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POST OFFICE ADDRESS (HOME ADDRESS 4, rue de la Cortine - - 13420 GEMENOS / FRANCE		
FULL NAME OF THIRD JOINT INVENTOR, IF ANY DOSSETTO Lucille	SIGNATURE	DATE 12/04/01 .
RESIDENCE (CITY & STATE/COUNTRY) – Résidence Saint Ambroise-Bt 2 13600 LA CIOTAT -FRANCE		CITIZENSHIP FRENCH
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FULL NAME OF FOURTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE (CITY & STATE/COUNTRY)		CITIZENSHIP
POST OFFICE ADDRESS (HOME ADDRESS		
FULL NAME OF FIFTH JOINT INVENTOR, IF ANY	SIGNATURE	DATE
RESIDENCE (CITY & STATE/COUNTRY)		CITIZENSHIP
POST OFFICE ADDRESS (HOME ADDRESS		